CONVENTIONS FOR REPORTING PLANT CHROMOSOME NUMBERS

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ABSTRACT

Original reports of chromosome numbers should reflect actual observations. To facilitate comparisons among taxa, reports of chromosome numbers in floras and other taxonomic works should be uniform.

RESUMEN

Los recuentos originales de números cromosómicos deberán reflejar las observaciones verdaderas. Con el fin de facilitar las comparaciones entre taxa, las citas de los números cromosómicos en floras y otros trabajos taxonómicos deberían ser uniformes.

Because of variations in ways in which chromosome numbers are reported and because untenable statements (such as "n = 6 II") continue to appear in botanical literature, we outline here some guidelines for reporting chromosome numbers in plants, in the hope of encouraging consistency. An important consideration in determining what to report, and how to report it, is context. We recognize two broad contexts in which chromosome numbers are usually cited: original observations and summaries.

ORIGINAL OBSERVATIONS

Reports of original counts of chromosome numbers should precisely indicate what was seen. We report chromosome counts from normal gametophytic cells as n numbers and counts from normal sporophytic cells as $2n$ numbers. We give examples for a group of plants with a base number of $x = 9$:

1. $n = 9$ for counts from mitotic figures in gametophytic cells (e.g., pollen tubes, cells from thalli of fern gametophytes) of a plant of a diploid taxon. Counts of $n = 9$ may also be reported from observations of dyads after cell-wall formation (see also, example 3). While such use of "$n = 9$" in referring

to a specific observation of chromosomes in cells of a gametophyte would be an accurate notation, a few qualifying words might well be included in the report because chromosome counts are seldom made from gametophytic cells.

2. $2n = 18$ for counts from mitotic figures (usually metaphase) in sporophytic cells (e.g., root-tip cells, leaf-primordia cells) of a diploid plant with $2n = 2x = 18$.

3. $2n = 9$ II for counts from meiotic figures (usually diakinesis or first metaphase) in sporophytic cells (e.g., pollen parent cells, spore parent cells) in a diploid plant. To refer to such counts from sporophytic cells as "gametic" or to cite such an observation as "$n = 9$ II" would be incorrect. The single "n" should be used only in reference to counts from gametophytic cells. Observations of 9 chromosomes at each pole in incompletely divided dyads of meiotic cells of a diploid plant should be reported as: "$2n = 18$ (9 at each pole in dyads)" — see also, example 1. In diploid hybrids, less than perfect pairing may be encountered and meiotic figures such as: $2n = 8$ II + 2 I, $2n = 7$ II + 4 I, $2n = 18$ I, etc., may be seen in plants with $2n = 2x = 18$.

4. $2n = 16$ for counts from mitotic figures in sporophytic cells of a dysploid plant; $2n = 8$ II for counts from meiotic figures in sporophytic cells (e.g., pollen or spore parent cells) of the same dysploid plant. [For discussions of dysploidy and aneuploidy and differences between them, see Dyer et al. (1970), Garber (1972), and papers cited by them. In brief, dysploids are characterized by changes in chromosome number usually accompanied by insignificant, if any, changes in numbers of genes per cell. In botanical literature, dysploid series sometimes have been mistakenly called "aneuploid series." In aneuploid plants, one or more chromosome(s) of the basic set is represented fewer or more times than expected in each cell and the number of genes per cell is significantly different from that normally found in euploid plants of the same population or taxon. Aneuploid plants are referred to as monosomics, trisomics, etc., usually exhibit greatly reduced fertility, and usually exhibit other traits, including morphological ones, reflecting their genic imbalance. Exceptionally, trisomic plants may be fertile, may form reproductively isolated populations, and may even evolve into distinct taxa.]

5. $2n = 19$, $2n = 17$, $2n = 35$, etc., for counts from mitotic figures and $2n = 9$ II + 1 I, $2n = 8$ II + 1 I, $2n = 17$ II + 1 I, etc., for counts from meiotic figures in sporophytic cells of aneuploid plants, which have certain chromosomes represented fewer or more than the expected number of times in each somatic cell (see discussion at example 4).

6. $2n = 27$ for counts from mitotic figures and $2n = 9$ II + 9 I, $2n = 8$ II + 11 I, $2n = 27$ I, etc., for counts from meiotic figures in sporophytic cells of

triploid plants, including hybrids. For such plants, statements such as $2n$ = 27 may usefully be expanded to $2n = 3x = 27$ to call attention to the presence of 3 sets of chromosomes in sporophytic cells. To report "$3n = 27$" for such plants would be misleading. Normally, $3n$ cells, $4n$ cells, $5n$ cells, etc., are found only in endosperm tissues, which we consider to be neither gametophytic nor sporophytic.

7. $2n = 36$ for counts from mitotic figures and $2n$ = 18 II, $2n$ = 16 II + 1 IV, $2n$ = 9 II + 18 I, etc., for counts from meiotic figures in sporophytic cells of tetraploid plants, including hybrids, with $2n = 4x = 36$.

8. $2n = 45$ for counts from mitotic figures and $2n$ = [various combinations of univalents, bivalents, and/or multivalents] for counts from meiotic figures in sporophytic cells of pentaploid plants, including hybrids, with $2n = 5x = 45$.

And so on for higher ploidy levels.

Reports of "B" or supernumerary chromosomes, or fragments, or rings or chains of chromosomes, etc., can be made by amplifying one of the examples above ($2n$ = 9 II + 2f; $2n$ = chain of 3 + 8 II + 8 I; $2n$ = ring of 4 + 16 II; etc.).

SUMMARIES

In floras and some other taxonomic works, in which chromosome number is included in descriptions or in some other bases for comparison, the chromosome numbers given are commonly each derived from more than one observation and are essentially indicators of the ploidy level(s) known for each taxon. We recommend statements such as "$2n$ = [total number of chromosomes per cell]" for each taxon regardless of the form of the original report(s). In this way a single format allows direct comparisons of chromosome numbers among euploids (diploids and "normal" polyploids), aneuploids, and dysploids.

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